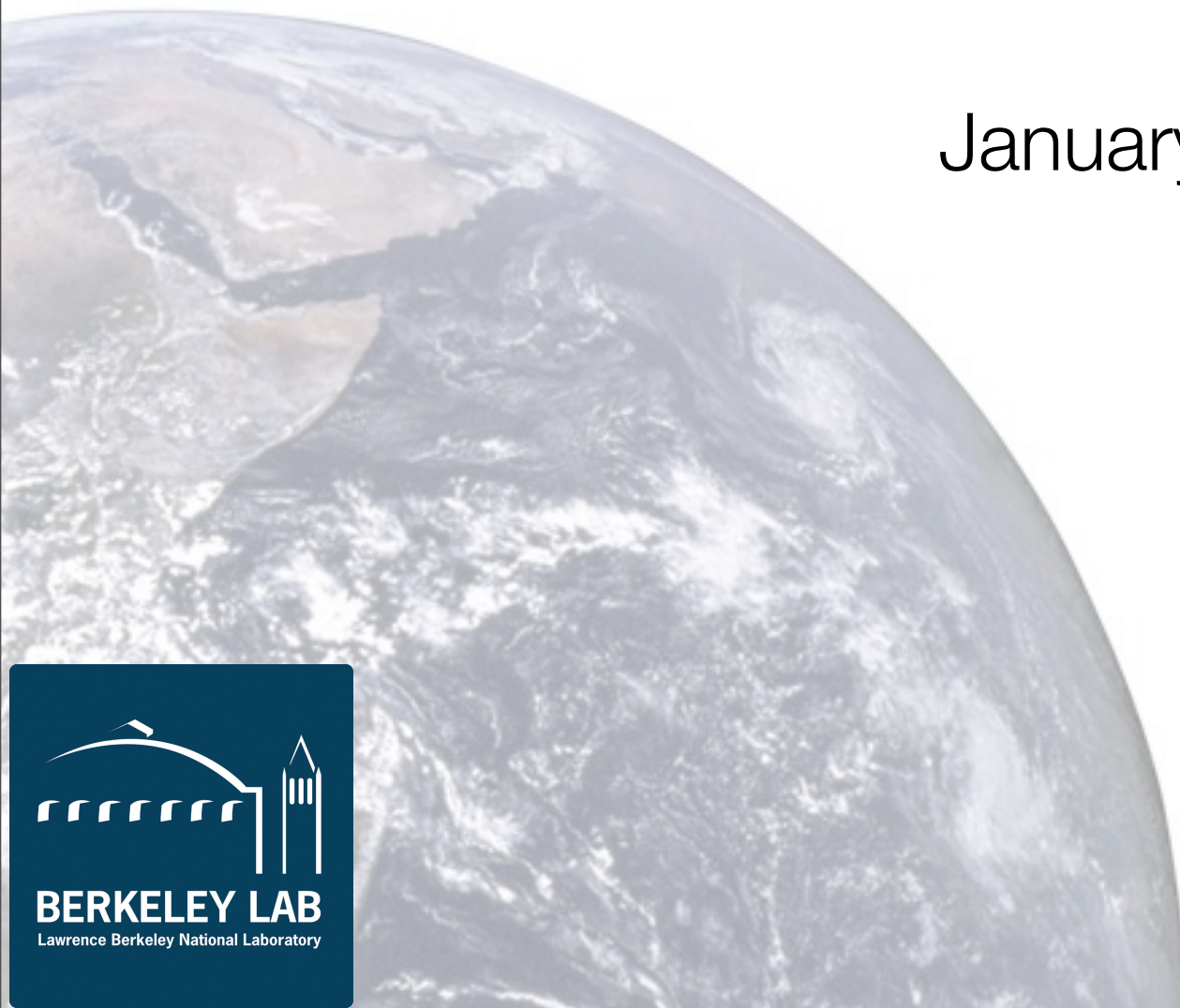


# Berkeley Lab All Hands Meeting

January 28, 2010



**BERKELEY LAB**  
Lawrence Berkeley National Laboratory

# Strategic Goals Input

**Thank you for all your suggestions!**

About 130 emails have been received, and ideas are still being submitted.

Many thoughtful proposals in each email, with some common themes.

A few examples...



**Basic research** continues to be the foundation of the lab's strength:

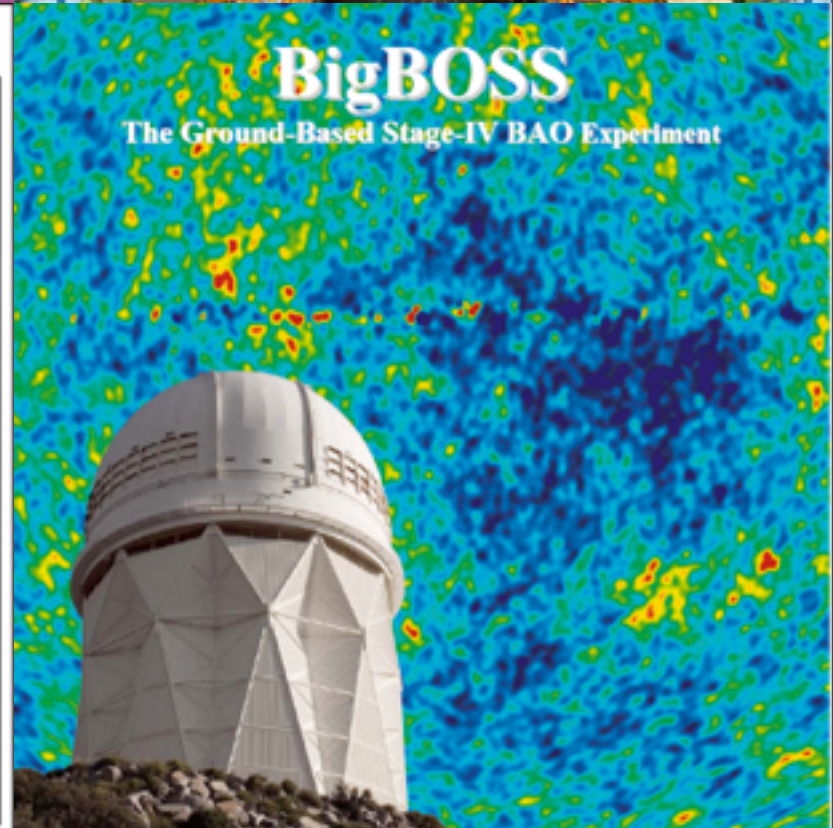
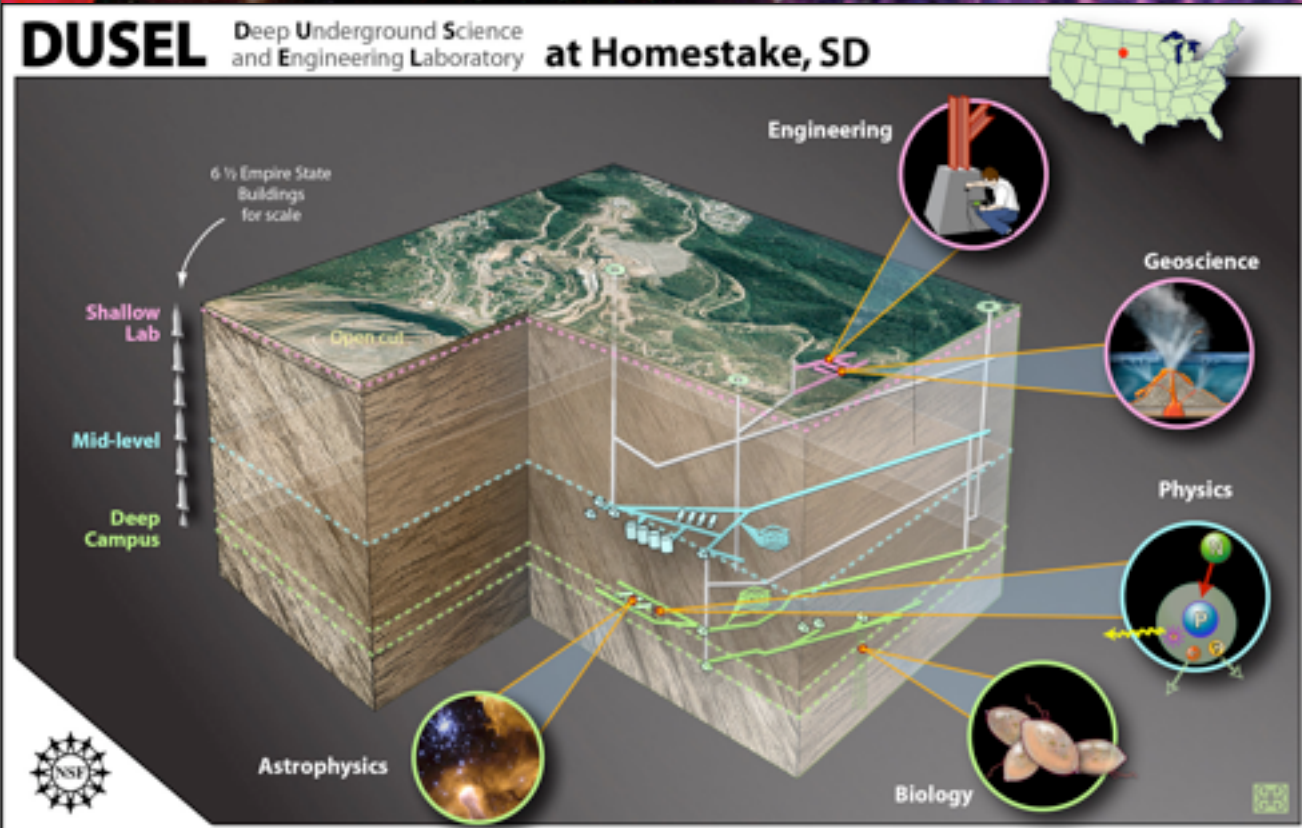
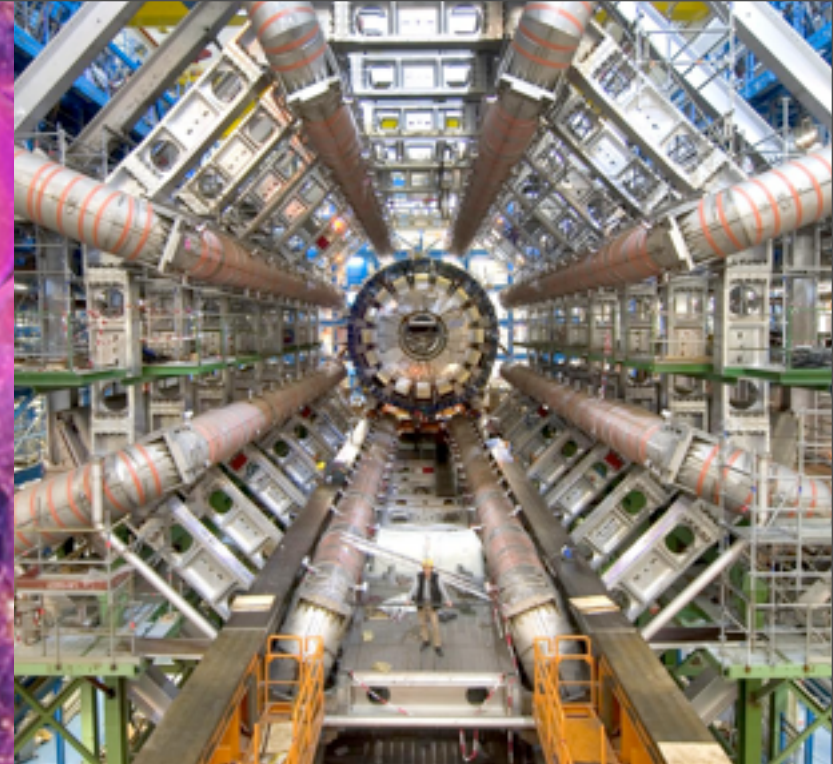
*“The Lab's continued strong focus on breakthroughs in basic science research as a bottom line, with a pragmatic eye toward the most important society-level technical challenges of our time, makes it a pleasure to wake up in the morning and head into work!”*

**...our lab-wide goals like CC2.0 and NGLS inspire, but do not supplant, our basic research agenda.**

# What should be the focus of a national lab like ours?

- Provide science solutions for big problems economy, energy, health, climate, information technology
- Answer the big questions origin and evolution of the universe, life, humans

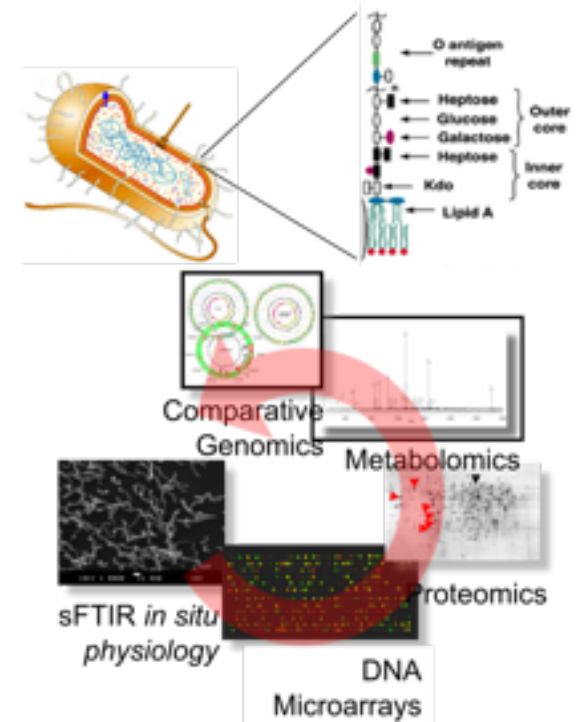




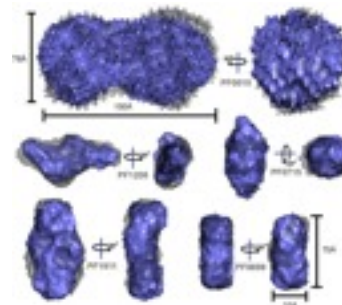
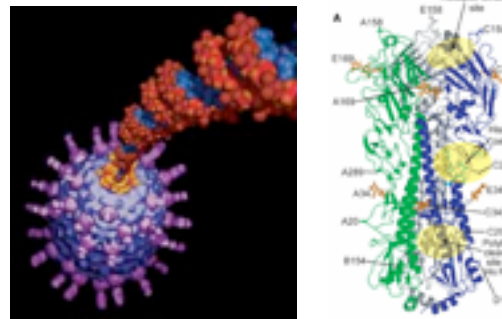
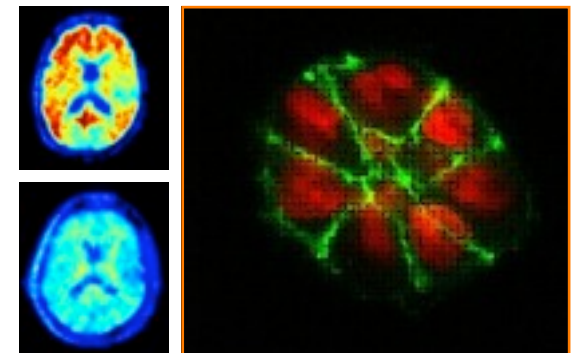
# From Basic Science to World-Changing Solutions

## Genomics & Synthetic Biology

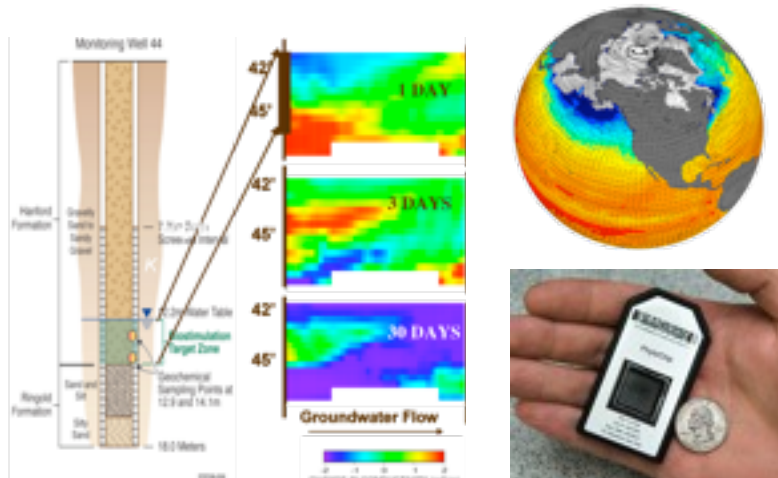
# Structural Biology

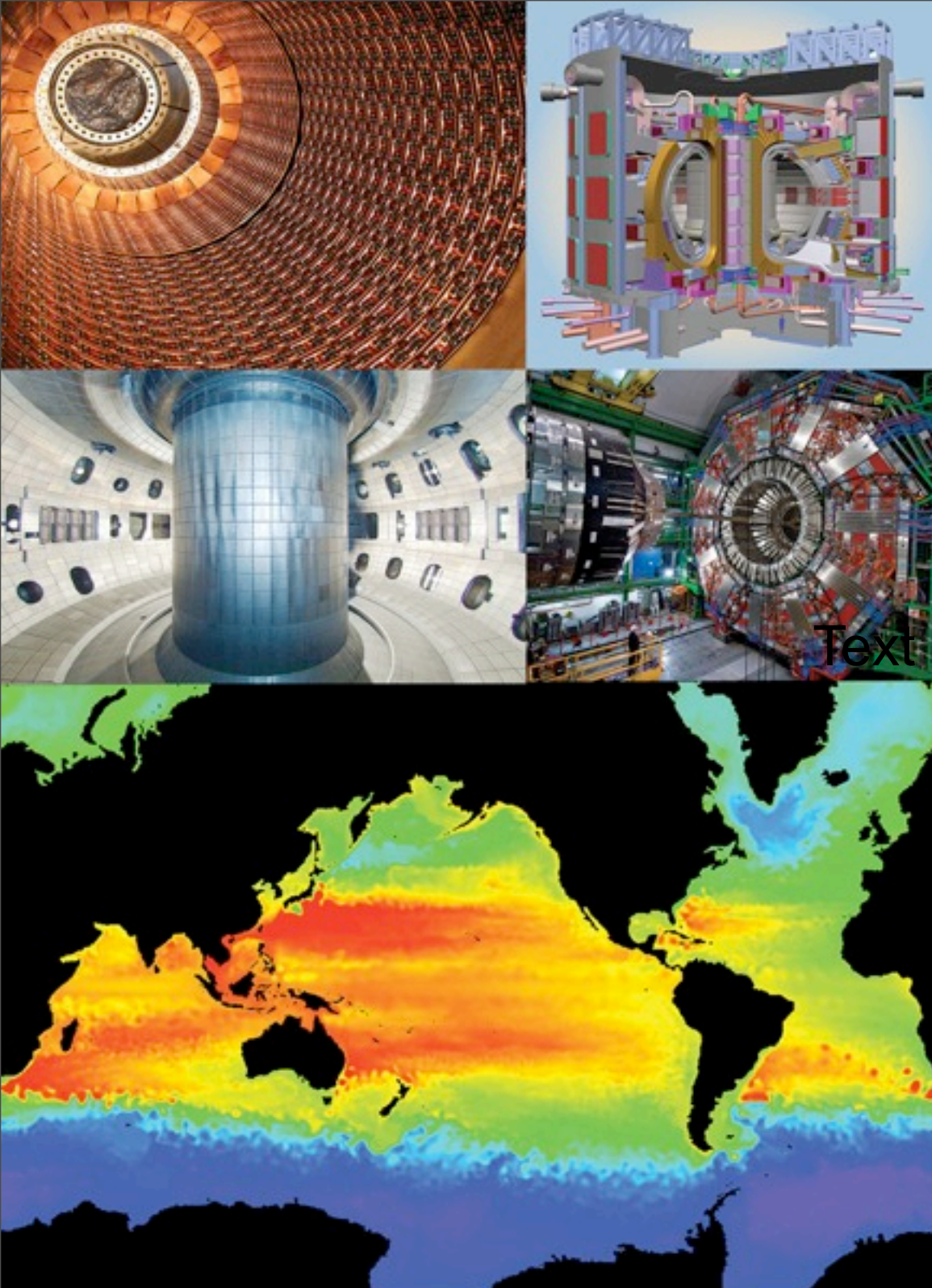


# Cancer & Radiation Biology



## Climate & Environmental Biology





Basic curiosity-driven research is the foundation of all that we do.

LDRD track 2 will continue this year.

Berkeley Lab reaches a higher level when we come together to address the great technical and scientific issues of our day.

Let's be **greener** at home:

*“We should ‘walk the talk’ at LBNL...”*

and

*“Make LBNL a model of efficient energy use in all operations...”*

OK, let's. This will be an explicit part of CC2.0 and our efficient operations initiatives

# Walking the talk: what we are doing now

## **Energy Reductions**

- Modest 10.3% reduction in lab-wide energy intensity use between 2003 and 2009
- On target to exceed the 30% reduction goal from 2003 levels by 2015
- Most progress is HVAC and system control adjustments
- Future savings from replacement of boilers, chillers, behavioral changes, smart meters...

## **Greening our Shuttle Service**

- New shuttles are more efficient
- They use B20 biodiesel
- We will explore the fuel mix in the future

## **Other GHG Reductions**

- Facilities and EH&S are working in concert to reduce and ensure no release of Sulfur Hexafluoride (SF6)

**...a good beginning, but much room to improve!**

**Safety** remains a top priority:

“Based on personal observations, communications, and review of some of the literature, I feel that we have wonderful opportunities for improving safety culture at LBNL.”

Agreed. Let's keep the momentum going. Seek continuous improvements in safety while reducing bureaucratic impediments.

The Strategic Planning Process  
will be more inclusive going forward

# Five strategic initiatives for Berkeley Lab today:



# Carbon Cycle 2.0 Initiative



# CC2.0 Symposium

## February 1-4, 2010

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- **Monday:** Berkeley Lab addressing global needs (B50 Auditorium, noon - 2pm)
- **Tuesday:** reducing demand through efficiency, storage, and low cost solar (B50 Auditorium, noon - 2pm)
- **Wednesday:** combustion, carbon capture and sequestration (B66 Auditorium, noon - 2pm)
- **Thursday:** Biofuels and fuels from sunlight (B50 Auditorium, noon - 2pm)

<http://carboncycle2.lbl.gov>



# Getting to Zero

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“If CO<sub>2</sub> reduction is important, we need to make it clear to people what really matters -- getting to zero.

With that kind of clarity, people will understand the need to get to zero and *begin to grasp the scope and scale of innovation that is needed.*”

Bill Gates, last week



Gasoline and diesel-like **biofuels** generated from lumber waste, crop wastes, solid waste, and non-food crops;

**Automobile batteries** with three times today's energy density that can survive 15 years of deep discharges;

**Photovoltaic solar power** with a fully installed cost four times cheaper than today's technology;

Computer design tools for commercial and residential **buildings** that enable reductions in energy consumption of up to 80 percent with investments that will pay for themselves in less than 10 years;

**Utility-scale energy storage systems** so that variable renewable energy sources such as wind or solar power can become base-load power generators.

# Steve Chu's List



# Societal needs in energy and environment challenge basic science to rise to a new level

Precision control of energy and matter on the nanoscale  
at low cost and high volume will be needed

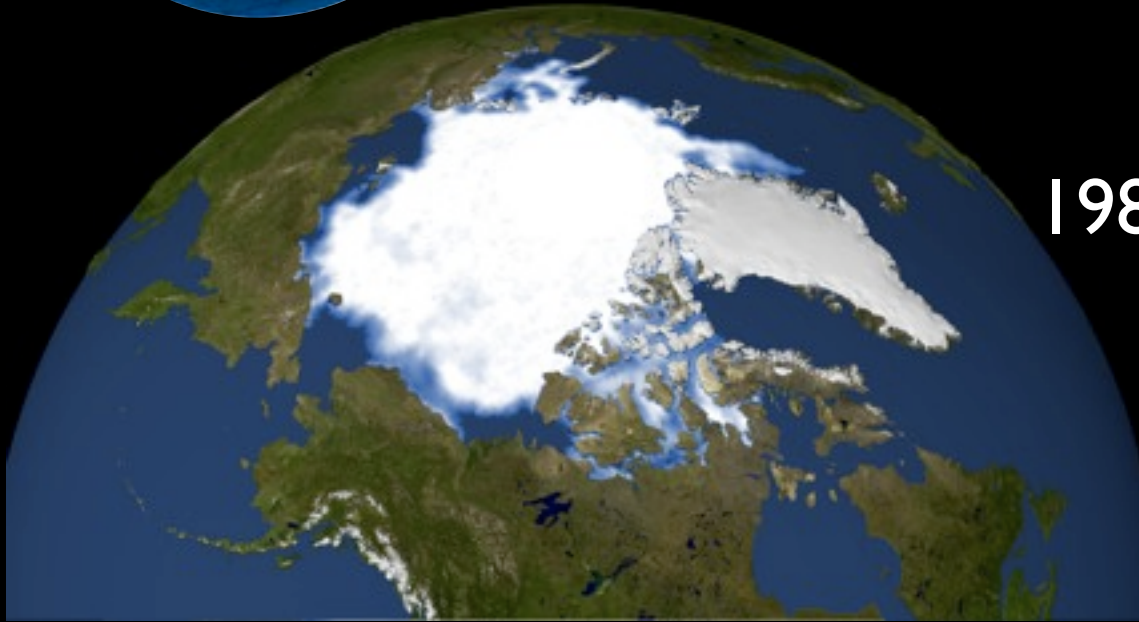
Control of energy transformation between light, chemical  
bonds, and electrons requires new observational tools capable  
of probing the still-hidden realms of the ultras-small and ultrafast

# Carbon Cycle 2.0 Initiative at Berkeley Lab





# Climate Modeling & Energy Analysis

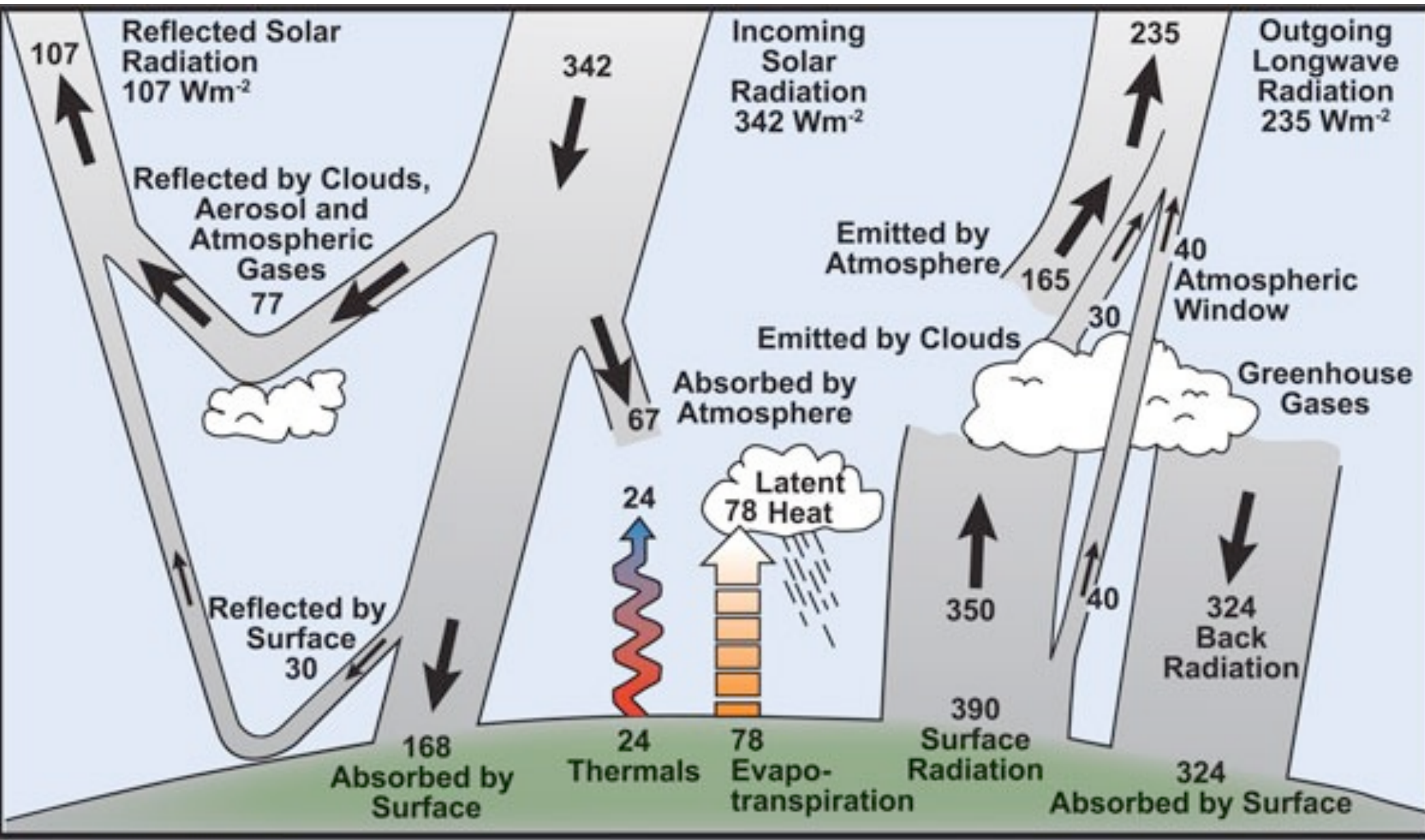


1980



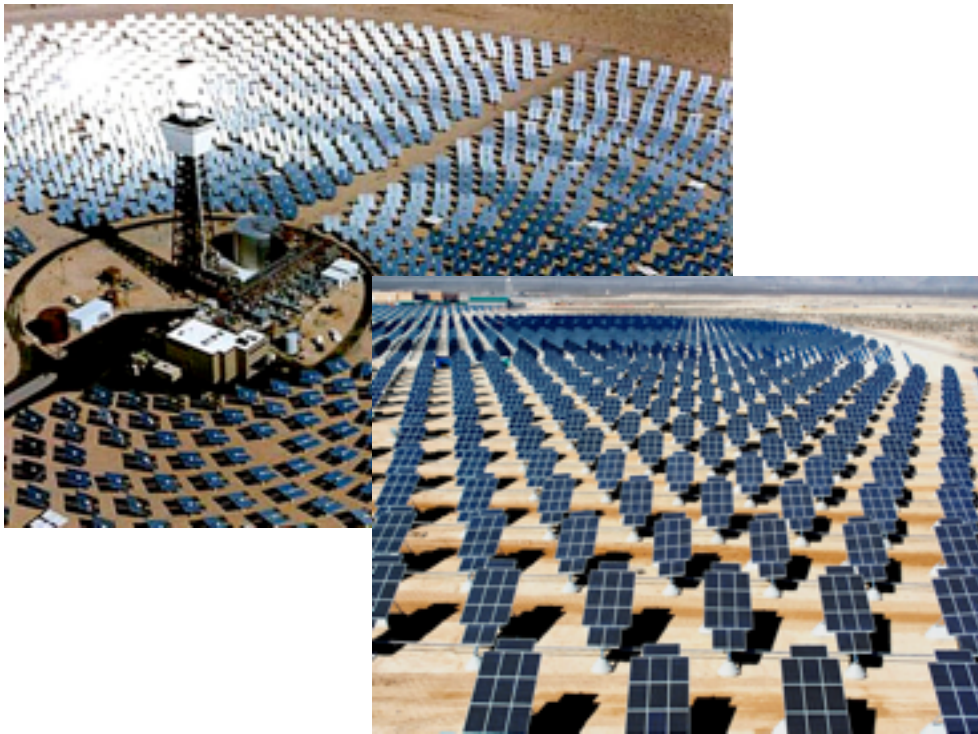
2007

# Climate Modeling - Sources and Sinks (+/-)



Source: IPCC

# Climate Modeling and Energy Technologies



Solar Arrays at millions of acres?  
What about heat island effects?

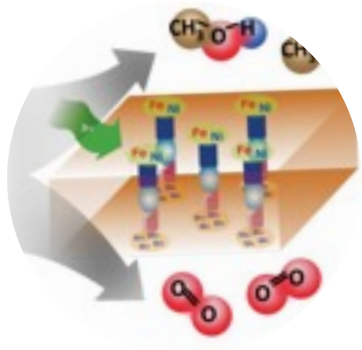


Coal to Natural Gas?  
What about aerosols?

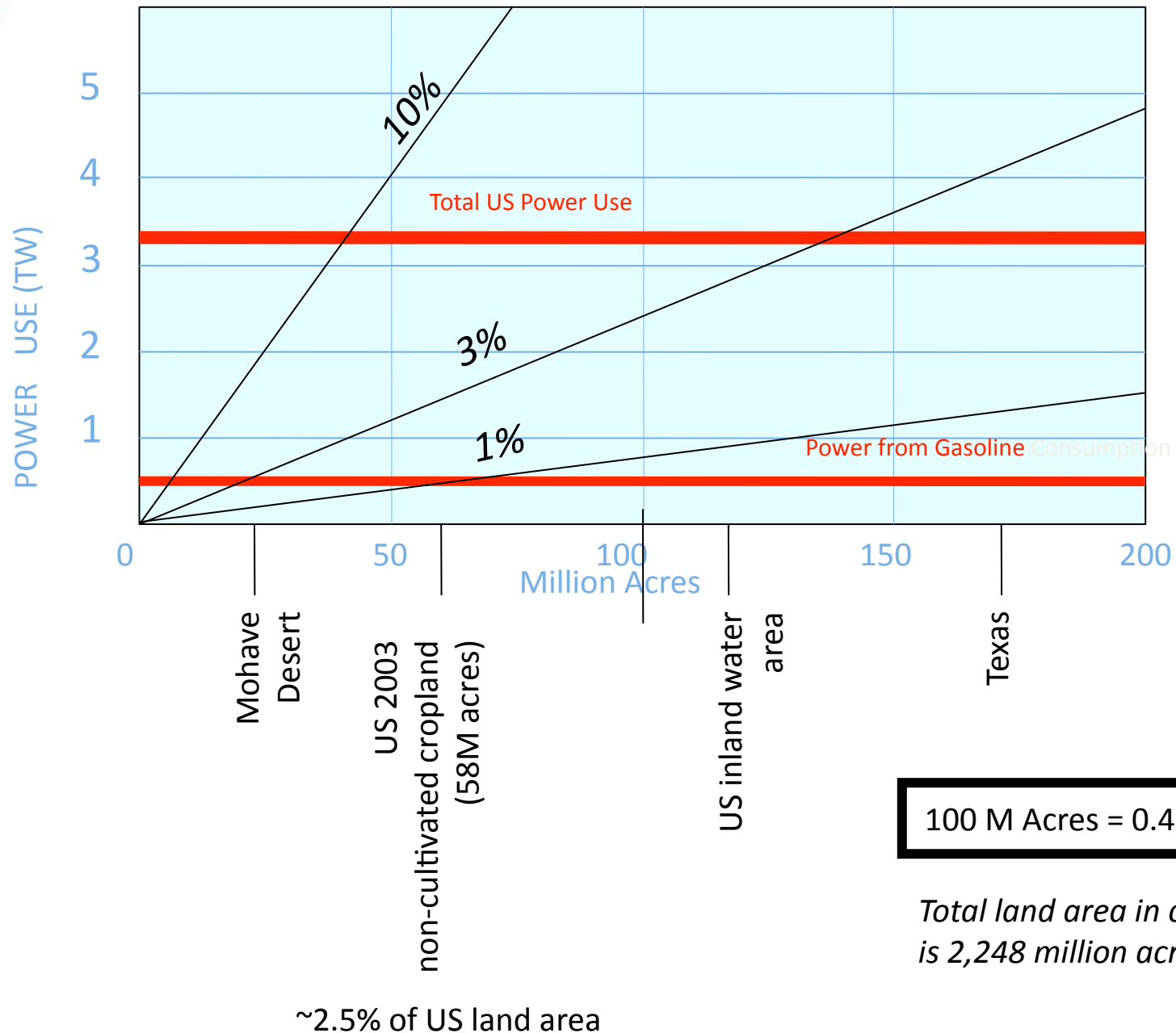


# Carbon Cycle 2.0 Initiative at Berkeley Lab

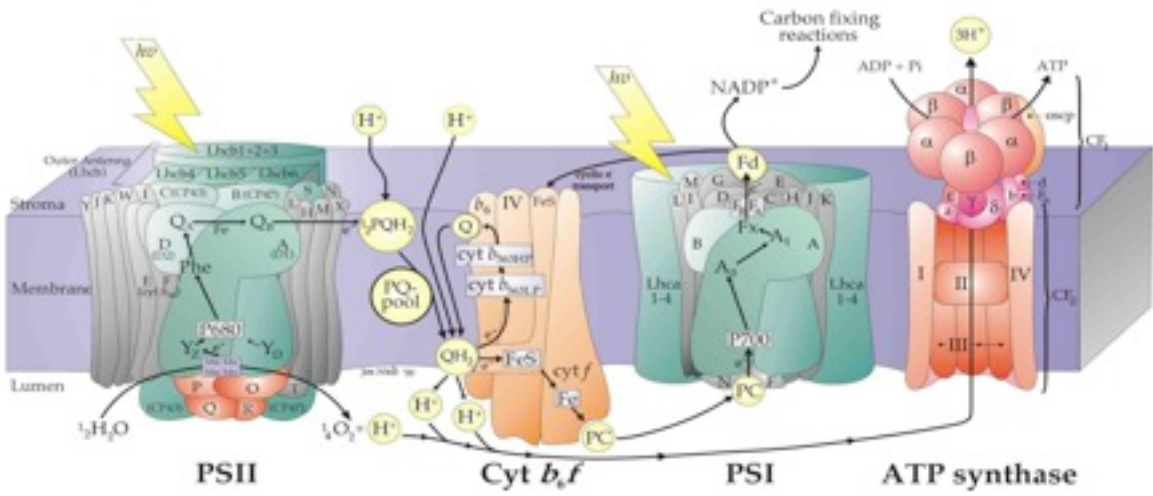




# Solar Efficiency & Land Usage

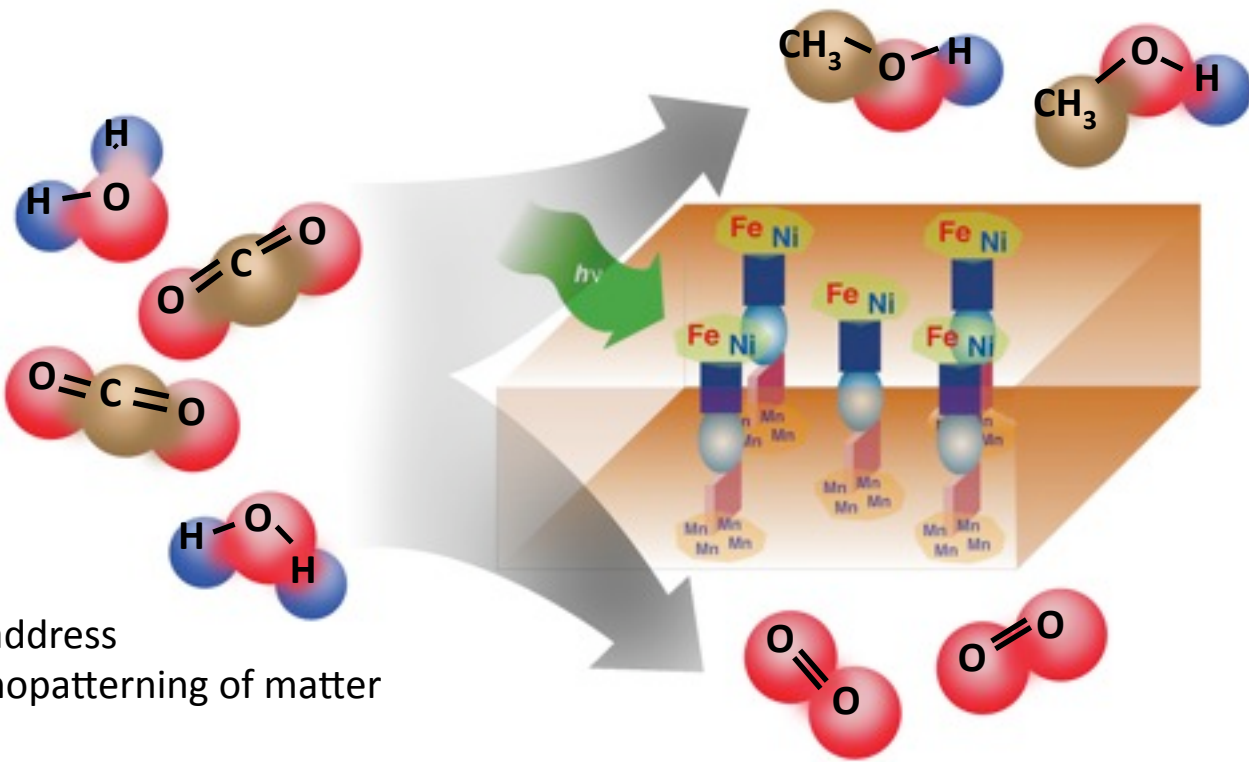


# Artificial Photosynthesis



Actual photosynthetic apparatus

## Artificial Photosynthesis



This project is only 18 months old and seeks to address very fundamental problems of catalysis, and nanopatterning of matter with precision on a vast scale

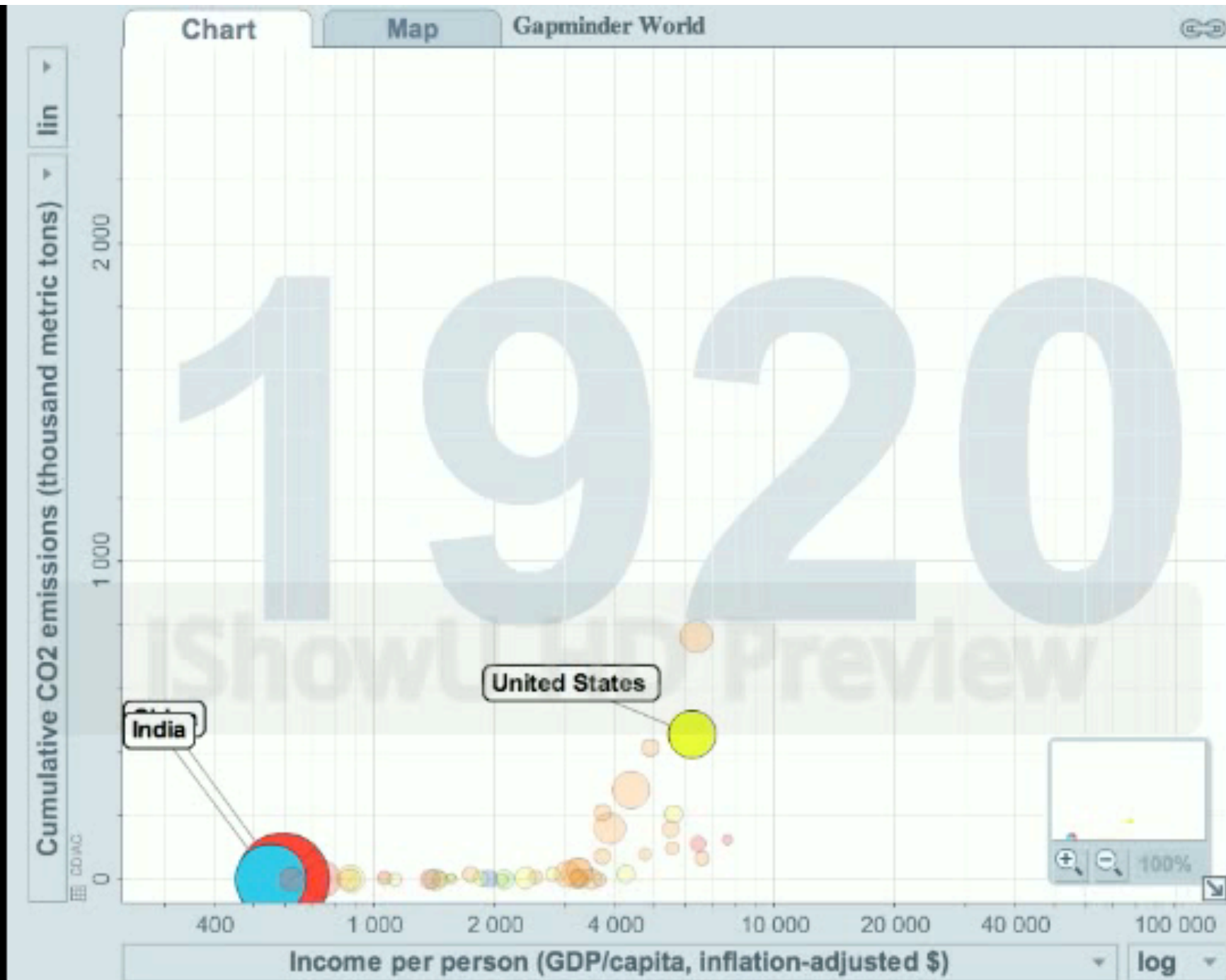
# Carbon Cycle 2.0 Initiative at Berkeley Lab



# Energy in the Developing World

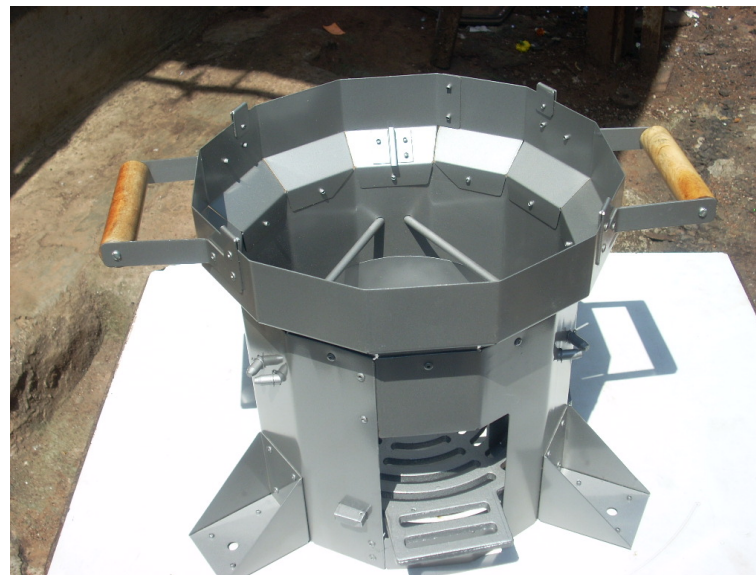


# Developing World - Future in the Balance

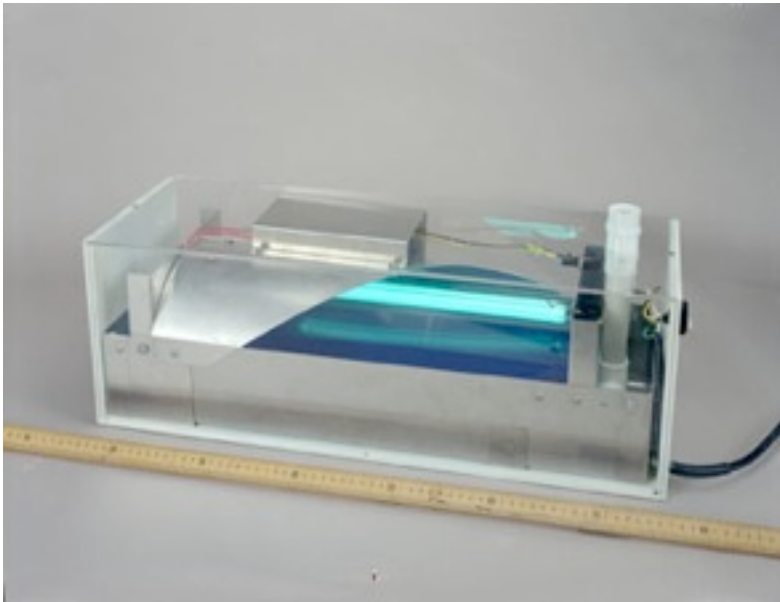


source: [gapminder.org](http://gapminder.org)

# Developing world success stories for LBL



**Berkeley  
Darfur  
Stove**

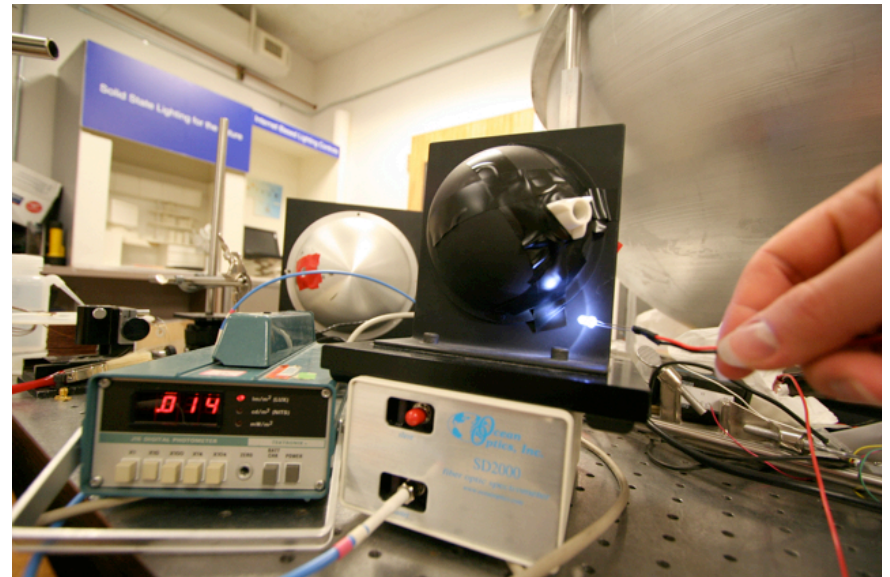


**UV  
Waterworks**

# Fuel Based Lighting - LUMINA



**Kerosene to LED**  
**0.4 GT of Annual**  
**CO2 Emissions**

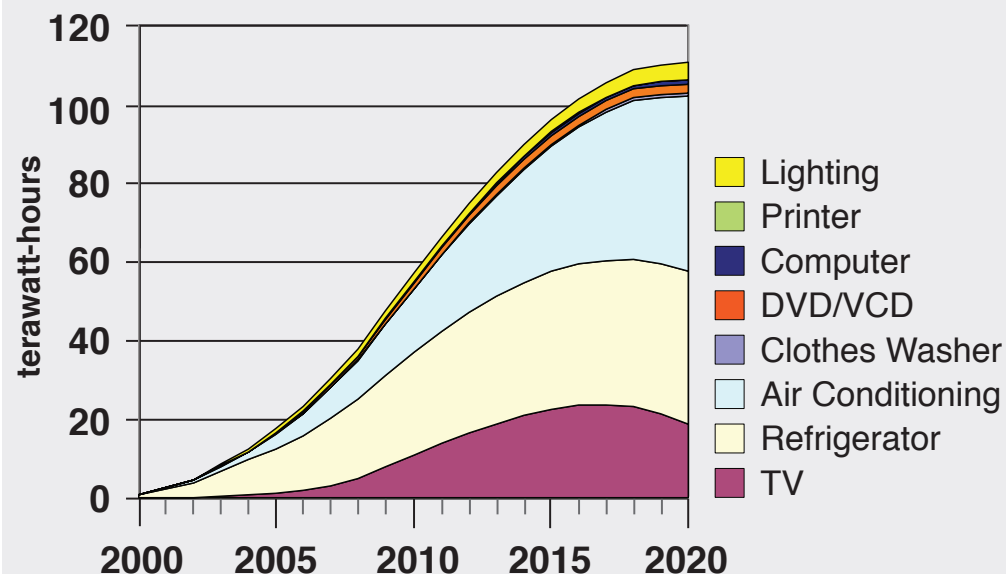


# China Energy Group 20<sup>th</sup> anniversary



- Energy Efficiency
- Industrial Best Practices (motor systems, oil refining, cement)
- Technical assistance
- Large scale building energy standards

**Figure 4: Estimated Savings from China's Appliance Standards Implemented from 1999-2007**



# India & BIJLEE



- Energy efficient data centers
- Green building standards
- Implemented demand side program in under 1 year (training and monitoring)



BIJLEE = Berkeley India Joint Leadership on Energy and Environment  
Also means "lightning"

# Berkeley Lab will compete for all three energy-innovation hub funding opportunities funded by Congress

## Buildings

M.A. Piette



## Solar Fuels

N. Lewis



## Nuclear

R. Rosner



# Carbon Cycle 2.0 Initiative at Berkeley Lab



# CC2.0 Symposium

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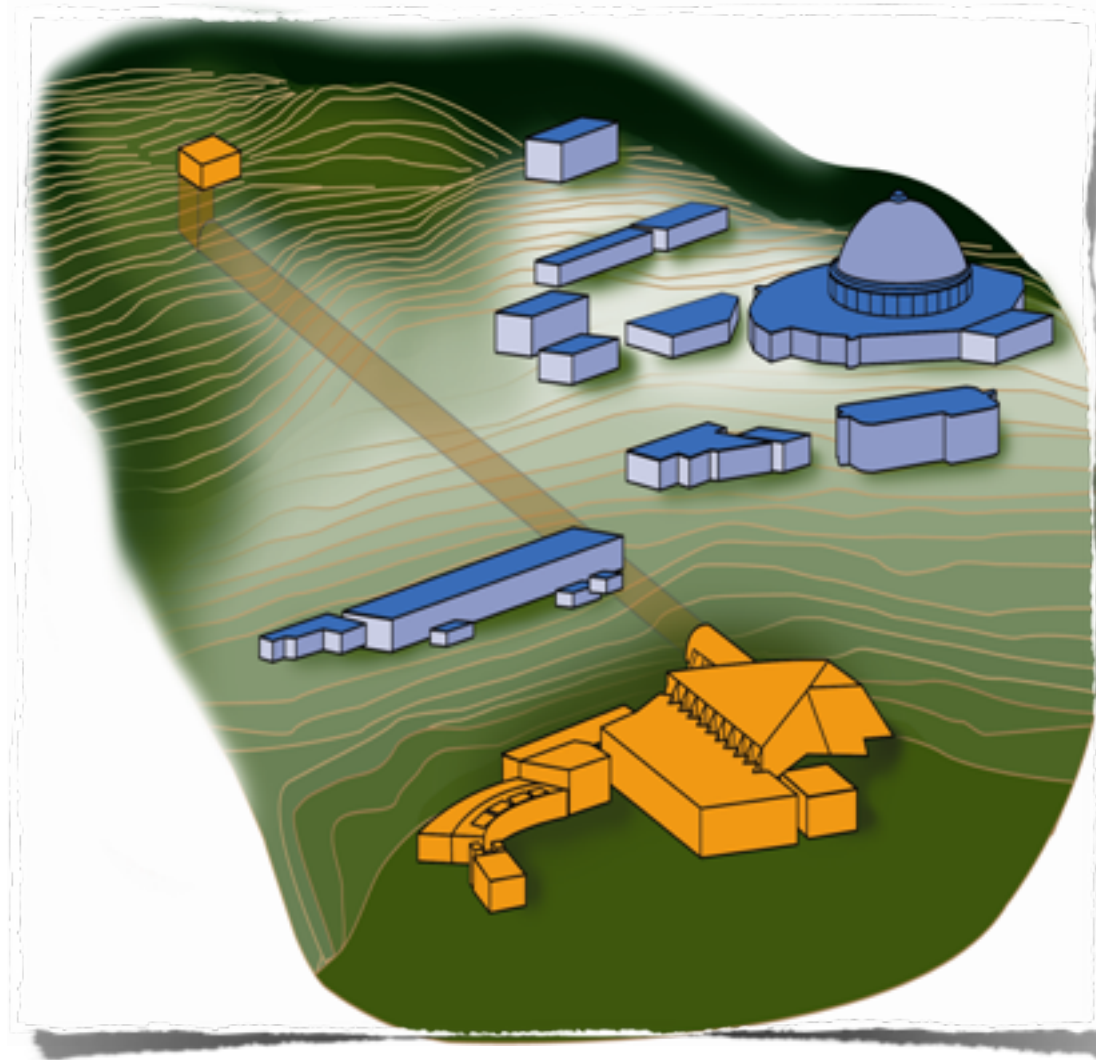
<http://carboncycle2.lbl.gov>



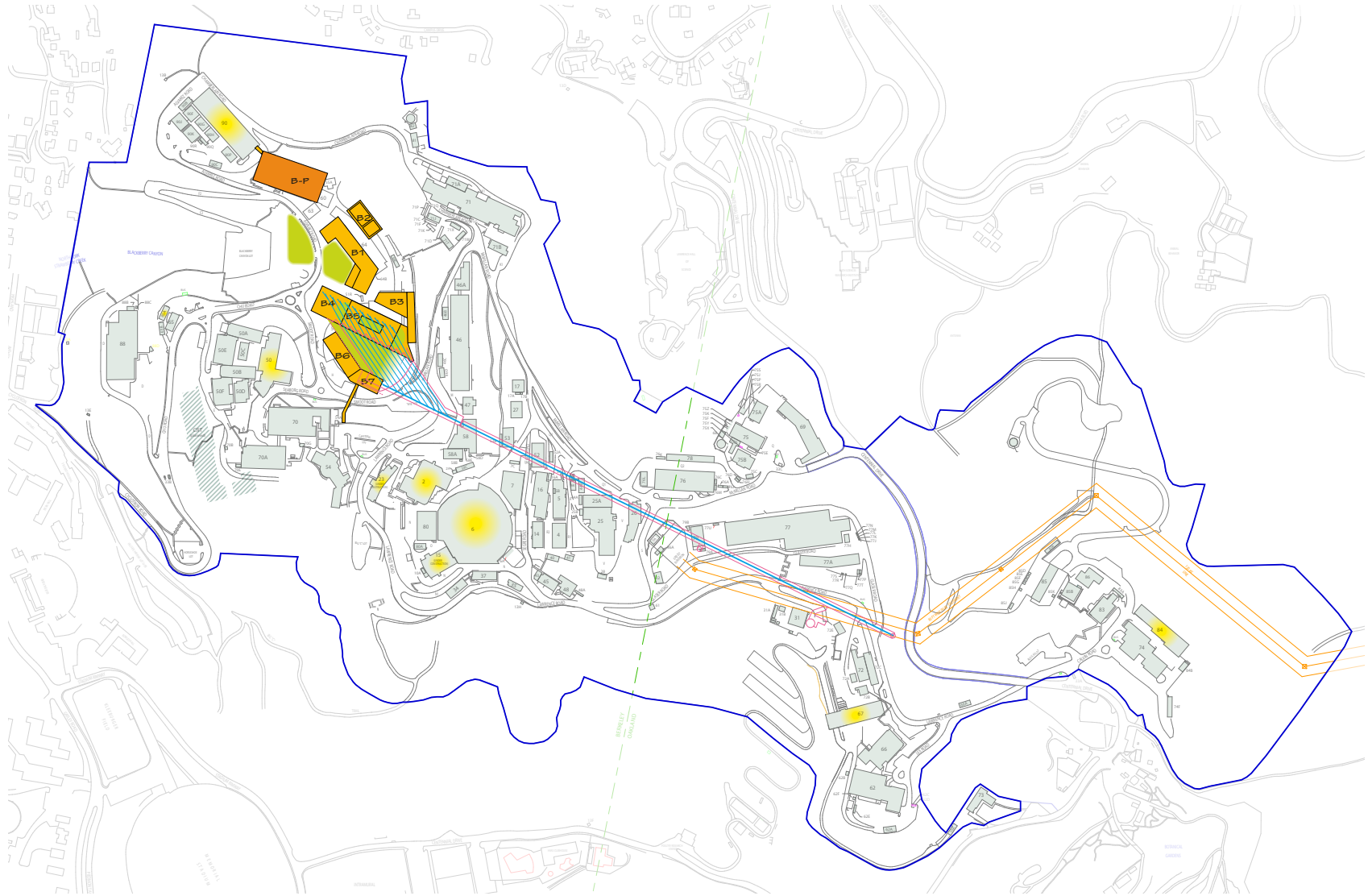
# Five strategic initiatives for Berkeley Lab today:



# Next Generation Light Source

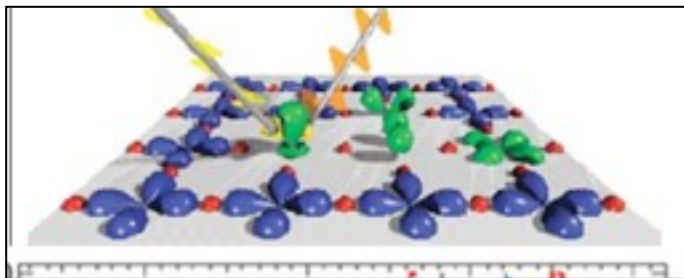
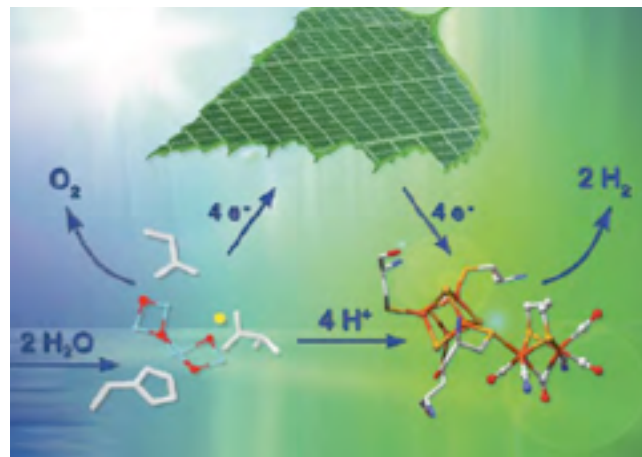
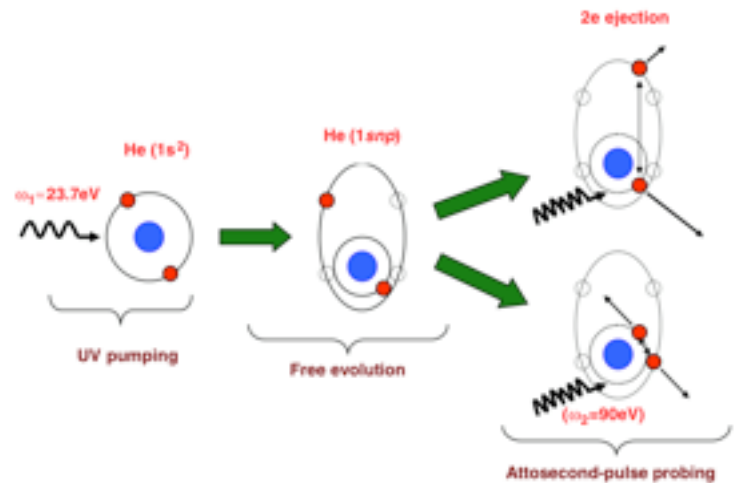


# Next Generation Light Source at Berkeley Lab



- A new light source, pictured here with the main scientific hall on the Bevatron site
- Light pulses a billion times brighter and a million times shorter than ALS

# Next Generation Light Source – Science Drivers



## Electron Dynamics

Atomic time unit = 24 attoseconds

Bohr orbit period  $\sim 150$  attoseconds

## Bond-making and breaking

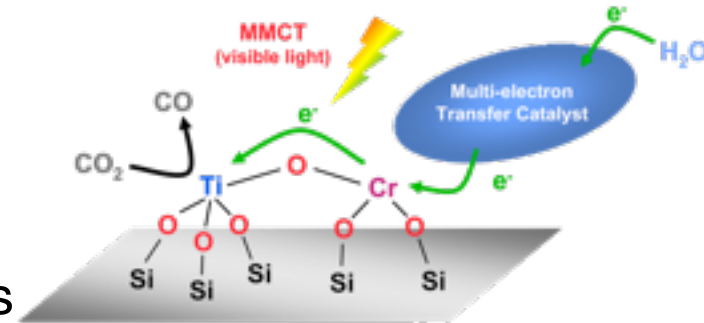
## Correlated electron phenomena

Impact on many disciplines of science

Foundation for energy and environmental sciences and technologies of the future

**NGLS is an array of soft x-ray lasers**  
for **3D imaging**, with **chemical selectivity**, measuring structure at the **nanoscale**, and dynamics on the **attosecond** timescale of electron motion

- Function relies on structure, bonding, and dynamics
  - soft x-rays reveal bonding and structure
  - hard x-rays reveal atomic positions
- Energy and information flow utilize ultrafast timescales
  - beat timescales for dissipation into unwanted modes:  
e.g., vision, photosynthesis -- we need efficient photovoltaics
  - allow multimode excitation to dissipate energy and minimize damage:  
e.g., DNA, damage -- we need materials that work in extreme conditions
  - speed, competing rates, and quantum pathways are critical to functional optimization
- Coherent radiation implies longitudinal and transverse coherence for
  - high resolution spatial imaging
  - high resolution spectroscopy
  - high peak and high average power for non-linear measurements
- Imaging matter and energy flow will utilize additional IR to x-ray radiation for pump and probe



# West Coast Light Source Strategy Joint with SLAC

- Cooperative effort to develop a comprehensive suite of tools
- Land at SFO- get access to a full suite of tools
- Leverage the tremendous success of ALS, SSRL, and the LCLS start-up
- LCLS II upgrade now at CD-0
- A model for how two labs can work together

# Five strategic initiatives for Berkeley Lab today:



# Community Relations



...a key part of the Berkeley Lab future

# Good progress on community relations

- Science at the Theatre
- Cooperation with city on energy efficiency of municipal buildings
- Letters of support for Old Town demolition from Mayors, Rep. Lee...
- Community Advisory Group
- Discussions with local neighborhood groups on space development plan at the lab



# Improved integration with our community



# Five strategic initiatives for Berkeley Lab today:



# Safe and Efficient Berkeley Lab



# Moving LBNL to a better safety culture

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Safety culture: attitudes, perceptions, and values that workers share in relation to safety.

LBNL is learning that safety is more effectively implemented when we don't have a punitive culture

Moving forward examples:

Use more leading indicators (near-hits instead of real hits)

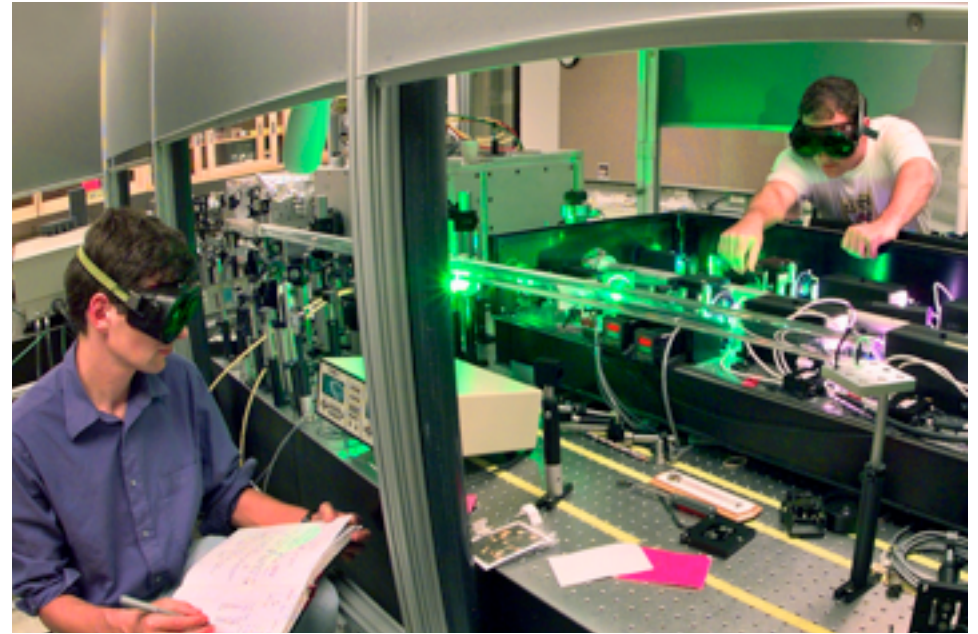
Reward positive behavior

Identify unsafe situations before accidents happen

# Safe and Efficient LBNL

Goal: To drive effectiveness and efficiency in operational activities throughout the Laboratory to increase resources available for science. Some examples:

- Peer review of operations within scientific divisions
- Guest processing redesign and HR IT improvement
- Peer review of operations divisions
- Optimize servers, cluster and storage systems for greater lab-wide efficiency
- Job Hazards Analysis (JHA) system being replaced with more user-friendly new work planning and control system



# Five strategic initiatives for Berkeley Lab today:



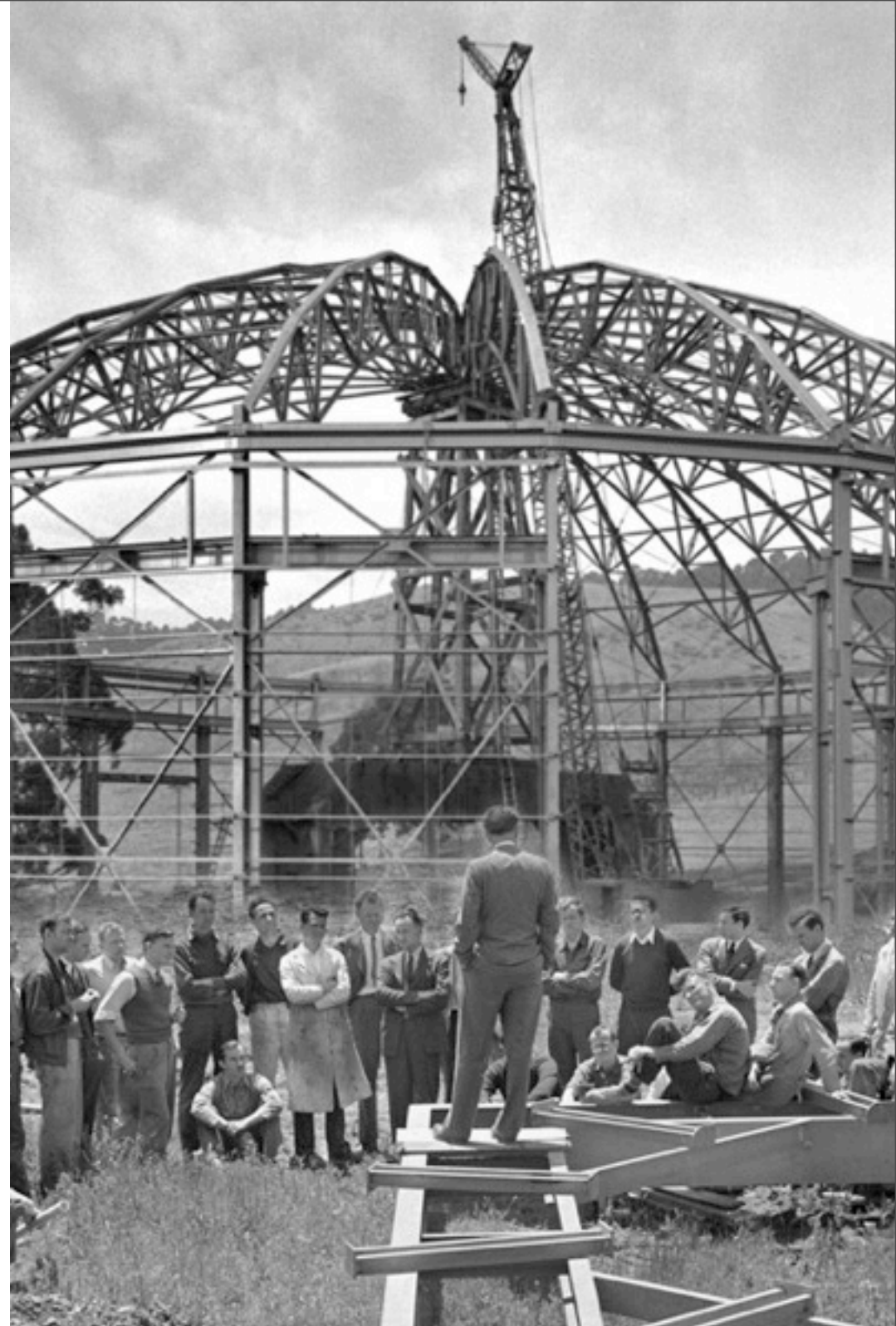
# Rejuvenated lab and office space onsite & second campus



# Space Planning Goals

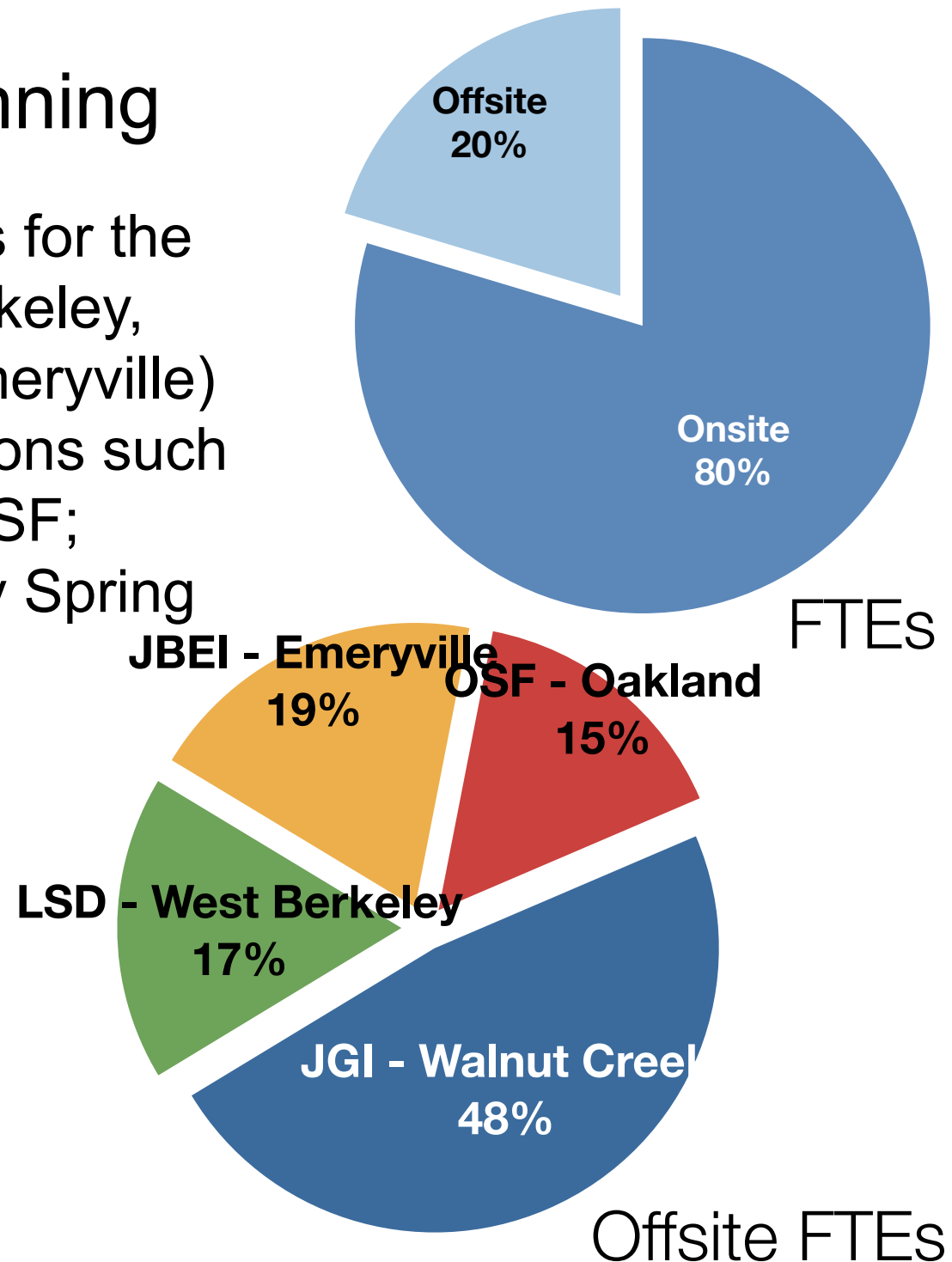
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- make Berkeley Lab competitive for the future with modern and efficient lab and office space
- be ready to locate new large-scale research infrastructure for the DOE mission
- co-locate synergistic programs and create more critical mass
- improve safety and health
- be a good neighbor in our community through better use of the site



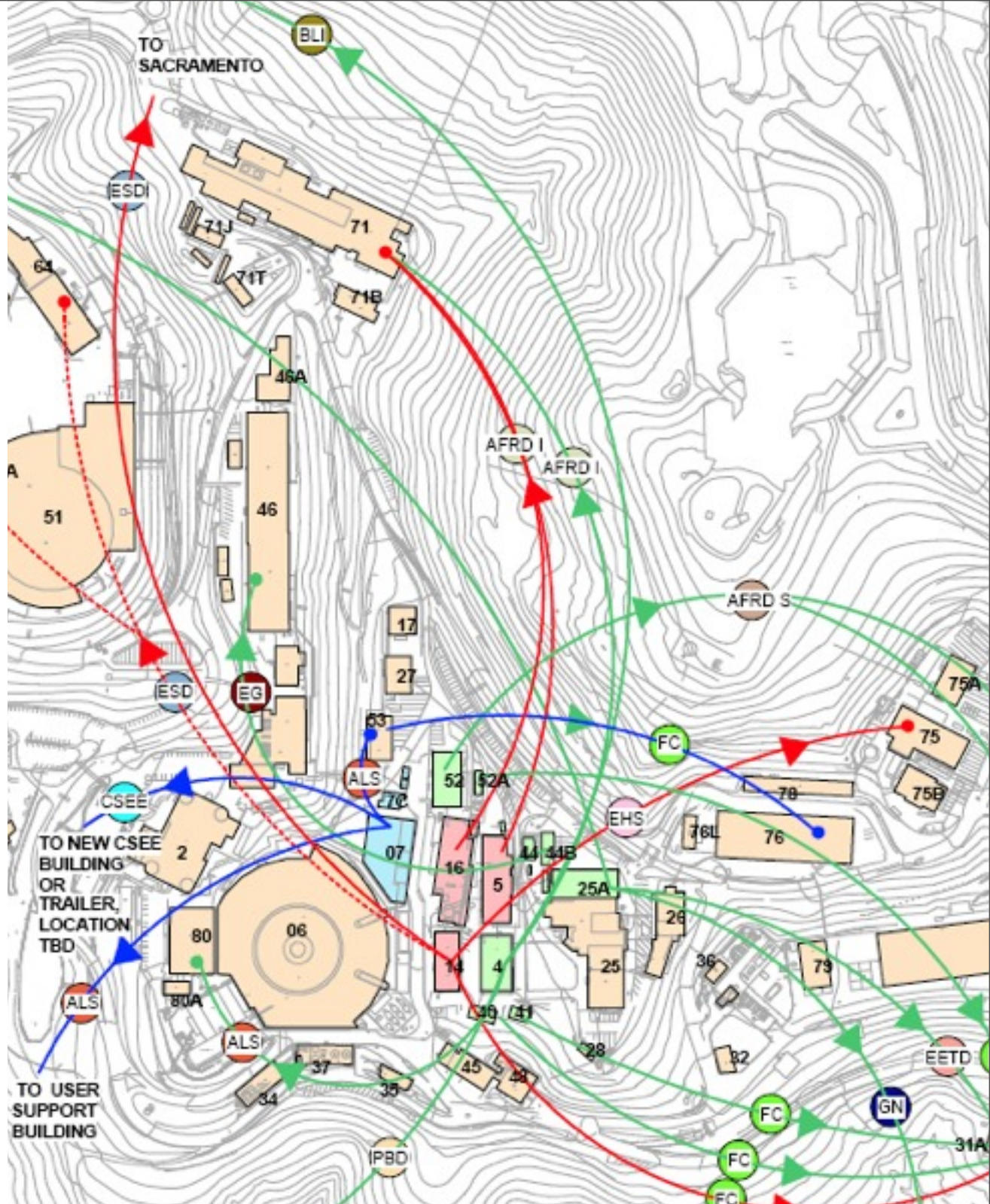
# Long-Term Master Planning

- Continue forward with plans for the Second Campus (West Berkeley, Richmond Field Station, Emeryville) to consolidate off-site locations such as JGI, Potter, JBEI, and OSF; primary site identification by Spring 2010
- Develop long-term Master Plan



# Near-term Space Problem

LBNL has a critical space shortage of approximately 500 workstations and 20,000 square feet of lab space over the next 18 months due to increased program funding



# Develop Governance Model for managing space

- Appointed LBNL Space Manager

- Anita Gursahani



- Chartered the LBNL Space Advisory Committee (SPAC)

- Damir Sudar, Chairperson
  - Ali Belkacem
  - Ernie Majer
  - Natalie Roe
  - Helen Cademartori
  - Rich McClure

# Role of the SPAC

- SPAC will provide recommendations to the Laboratory Director, Deputy Director, COO, and Space Manager on
  - Guidelines, policies, procedures and metrics for the allocation and utilization of space across the Laboratory;
  - Resolution of space allocation conflicts that can not be resolved by the Committee;
  - Opportunities for increased efficiency and optimization based on space utilization survey data;
  - Capital appropriations, purchases and improvements as these impact space utilization;
  - Long term actions to meet LBNL's Strategic Space Management Plan and initiatives related to space.

# Five strategic initiatives for Berkeley Lab today:

